

## WHAT IS CLAIMED IS:

1. In a network of multi-processors having a series of local systems operated by Client-Users wherein a series of defined operating policies (P) are stored along with acceptable parameter limits for each policy, each said policy having parameters for desired sample sets and upper U and lower L limits on counter values associated with each system resource, a method for developing a health trend analysis of future possible problems in network resources comprising the steps of:
  - 5 (a) initializing an algorithm for processing a selected health trend policy (P);
  - (b) collecting a sample set of data points for said selected policy;
  - (c) performing basic calculations to provide a summary of said sample set;
  - 10 (d) analyzing said summary based on the nature of said selected health policy in order to determine whether that summary supports the conclusion of an upward trend or downward trend.

2. The method or claim 1 wherein step (d) of analyzing said summary includes the steps of:

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(d1) surveying the last group of "x" sample sets to see if said group indicates an upward trend or downward trend;

(d2) notifying said client-users as to the type of trend indicated.

3. The method of claim 1 wherein step (d) of analyzing includes the step of:

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(3d1) surveying said sample sets to determine that a steady state has occurred and that "no trend" is indicated.

4. The method of claim 2 wherein step (d1) of surveying includes the step of:

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(4d1a) Eliminating spikes in the sample set of data points which spikes reach beyond the upper boundary "U" or lower boundary "L" of the parameters set for the selected policy involved, thus to smooth out the indicated trend of data points in said sample set.

5. In a network of multi-processors having a series of local systems operated by Client-Users wherein a series of defined operating policies (P) are stored along with acceptable parameter limits for each policy, a method for  
5 developing a health trend analysis of future possible problems in network resources comprising the steps of:

(a) accessing a health counter value for the allowable upper boundary "U" for a selected operating policy (P);

10 (b) accessing a health counter value for the allowable lower boundary "L" for said selected operating policy (P).

(c) establishing, via a trend counter, a trend of upward or downward increases or decreases in  
15 the availability of system resources.

6. The method of Claim 5 which includes the step of:

(d) acquiring a series of data points associated with said selected policy (P);

(e) setting a counter limit "TCL" (Trend Counter Limit) to a value specified for the selected policy (P).

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7. The method of claim 5 wherein step (c) of establishing a trend includes the steps of:

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(c1) collecting data points, in a sample set "N" where "N" is the number of collected data points;

(c2) verifying that the number of collected data points is = "N";

(c3) calculating the average percent difference "A" which represents the cumulative difference between each data point and the one just before it for all points in the set;

(c4) multiplying the average difference "A" by the number "N" of data points to get a result  $A \times N$ ;

(c5) calculating a common sense value "C" by finding the percent difference between the first value and the last value of the sample set;

20 (c6) establishing whether the product  $A^*N$  is greater than said lower boundary "L" and less than said upper boundary "U";  
(c7) preparing a summary of step (c6).

8. The method of claim 7 wherein step (c7) includes the steps of:

5 (4c7a) determining that the value of  $A^*N$  falls between "L" and "U" (YES);  
(4c7b) incrementing a counter designated as "not-a-trend" counter;  
(4c7c) querying whether said "not-a-trend" counter value is greater than the value of TCL (Trend Counter Limit);  
10 (4c7d) if "not-a-trend" counter is greater than the value of TCL (YES), then deleting all collected samples;  
(4c7e) resuming operations at step (c1) of Claim 7.

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9. The method of claim 7 wherein step (c7) includes the steps of:

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(5c7a) determining that the A\*N value does not fall between "L" and "U";

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(5c7b) querying whether the trend type is upward as pre-ordained in health policy specifications;

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(5c7c) if the trend is upward, then querying whether A\*N value is greater than the upper boundary "U"; and if so;

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(5c7d) determining whether the common sense value "C" is greater than the upper boundary value "U"; and if so,

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(5c7e) calculating the size of the increase (Delta I) which indicates the average value of the sample set multiplied by the number of data points in the set multiplied by the first value in the set;

(5c7f) incrementing a trend counter and zeroing out said "not-a-trend" counter;

(5c7g) checking to see if said trend counter value is greater

30 than the trend counter limit  
value (TCL); and if so,  
  
35 (5c7h) reporting an upward trend  
to said Client-User;  
  
40 (5c7i) additionally smoothing  
out the data collected by using  
reported values below the lower  
boundary L to offset reported  
values above the upper boundary  
U to eliminate spikes and false  
alerts.

10. The method of claim 7 wherein step (c7) includes the steps of:

5 and "U";

10 (6c7b) querying whether the trend type is downward as specified in health policy specifications;

15 (6c7c) if the trend is downward, then querying whether  $A^*N$  value is less than the lower boundary "L"; and if so,

20 (6c7d) determining whether the common sense value "C" is less than the lower boundary value "L", and if so,

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(6c7e) calculating the size of the decrease (Delta D) which indicates the absolute average value of the sample set multiplied by the number of data points in the set multiplied by the first value in the set;

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(6c7f) incrementing a trend counter and zeroing out said "not-a-trend" counter;

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(6c7g) checking to see if said trend counter value is greater than the trend counter limit value (TCL); and if so,

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(6c7h) reporting a downward trend to said Client-User;

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(6c7i) additionally smoothing out the data collected by using reported values above the upper boundary U to offset reported values below the lower boundary to eliminate spikes and false alerts.

11. In a multi-processor network holding multiple numbers of "local systems" which monitor themselves to create a collection of health events and predictive events and which include operating policies (P) to be 5 effectuated, a system for sensing future trends which predict future problems which may occur in system resources comprising:

(a) means to initialize an algorithm for a specified health trend policy;

10 (b) means to collect a sample set of data points using a counter at X points in a time interval sampling period;

(c) means for calculating a value which represents the general increase or decrease in 15 the allocation-utilization of a monitored resource.

12. The system of claim 11 which includes:

(d) means for calculating the average "A" percent difference of the values in the current sample set;

5 (e) means to determine that the value "A" falls between a low boundary value "L" and an upper boundary value "U" for the selected policy involved;

10 (f) means to utilize a trend counter limit (TCL) to determine if the number of collected sample sets exceeds the TCL value, and, if so;

15 (g) means to indicate that the value of the monitored health index for that resource is in a "steady state" and there is no trend involved.

13. The system of claim 12 wherein said means for calculating (d) includes:

5 (13d1) means to recognize that said value "A" indicates that the value "A" is outside the upper U and lower L boundary set for the selected policy (P) and said policy is monitoring for an upward trend;

5 (13d2) means to recognize that said value "A" is above the upper boundary value "U" and also a common sense value indicates the first data point is below the last data point (upward trend);

14. The system of claim 12 wherein said means for calculating (d) includes:

5 (14d1) means for determining if the average percent difference "A" is equal to or less than both the upper boundary "U" and the lower boundary "L" for the selected policy (P); and, if so;

10 (14d2) means for calculating the downward movement (Delta D) by multiplying "A" by the first value in the sample set to get an estimated data point;

15 (14d3) means for indicating a downward trend.

15. The system of claim 14 wherein each means (14d3) for indicating a trend includes:

5 (14d3a) means for smoothing out data points in said sample set which involve inadvertent spikes in value.